

## Knowledge Production with Design Thinking for Citizen Science

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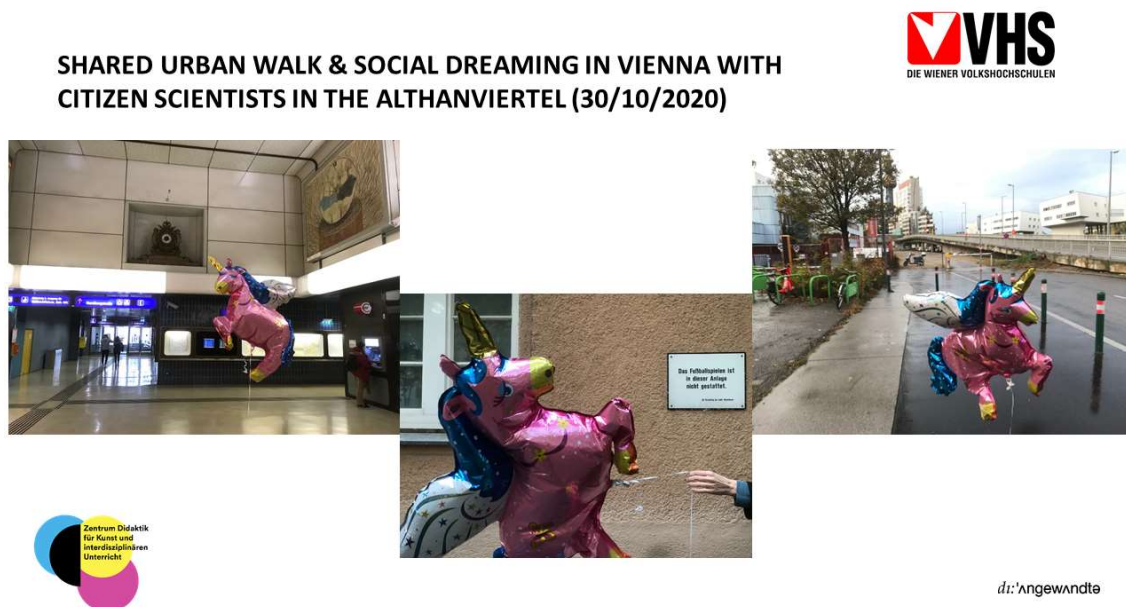
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Design and the arts are recognized to expand their fields as research approaches enabling new insights, questions and methods in science and education. Design thinking as well as speculative and participatory design provide approaches between composition, craft and (collaborative) knowledge production. Design thinking is a systematic and at the same time flexible process that can enable volunteer researchers and lay designers to work in transdisciplinary teams taking over a strategic role in citizen science (CS) projects. The author claims the potential of design thinking and likes to inspire further experimentation with creativity and idiosyncrasies as resources for CS and open innovation. The article provides an overview on related approaches and highlights potential benefits to CS based on a literature research and was inspired by two workshops – including “Kollaboratives Forschen und Spekulieren – Design thinking für Citizen Scientists” at the occasion of ACSC2023.

*Austrian Citizen Science Conference 2023, ACSC2023  
19 - 21 April 2023  
Linz, Austria*

## 1. New Ways of Enabling – an Introduction

Taking advantage of design thinking in citizen science (CS) has gained interest recently, for example in the context of two small-scale projects with citizen scientists in Japanese suburbs prototyping social innovation [1]. Furthermore, some authors introduced the term “citizen design science” aiming to integrate citizens’ ideas into the urban planning process [2] while the project “Digitale Dörfer” used design thinking to foster digitalization in the rural context [3]. Similar to the scope of these experiments, the author of this article implemented a student workshop in collaboration with the Zentrum Didaktik für Kunst und interdisziplinären Unterricht and the Wiener Volkshochschulen in 2020. In this example a mix of methods – bringing together design thinking and open-ended approaches – was implemented. The workshop combined approaches such as shared walk, social dreaming and mutual learning and welcomed students of art education and volunteer researchers to discuss CS and socially innovative ideas for selected quarters in Vienna (see Figure 1).



**Fig. 1** Shared walk of the CS workshop titled “Art education meets circular economy. Imagination für neue Zukunftsbilder und Bürger\*inneninitiative“

Deducing from outlined examples, creative approaches help to go beyond consultation mode and enable alternative insights, questions, methods and tools in science and education. Still, design (and the arts) related approaches are often understood as an add-on to the scientific process, for example to facilitate target group oriented science communication. In this article, design thinking is discussed as a potential mean for CS to generate socially robust knowledge. In a transdisciplinary set-up, design thinking enables citizens to take over a strategic or a leading role from the start of the research process.

## 2. Collaborative Knowledge Production with the help of Design Thinking?

Design thinking as well as speculative and participatory design are methods between composition, craft and (collaborative) knowledge production. They can work as a framework to foster innovative approaches in citizen science and use skills such as imagination, speculation

and storytelling to define and create a joint desirable future, object, service or even policy for the living environment.

The term design thinking emerged in the 1990s, mainly used in design research and strategic management. Term covers an oscillating concept, which can be understood as a passpartout for design-enabled problem-solving approaches – and from an epistemological perspective, as an alternative way of thinking [i.e. 4, 5]. Design thinking can be explained “[...] as different from scientific thinking (analytic, reductionist, aiming at explanation) and also different from artistic thinking (taking the artist’s self as primary criterion). For these reasons design thinking has to claim theoretical and methodological autonomy” [6].

Against this background, design thinking is a systematic and at the same time flexible process with a strong participant orientation. The application is an iterative process along analytical and synthetic phases [7] such as to define, research, ideate, prototype, choose, implement and learn. While in artistic or artful thinking open-ended approaches are frequently in use, design thinking pursues clear objectives in a structured way.

In addition, approach focuses on how to solve real-world problems using the question “How might we...?”, while speculative design is an approach that enables thinking about the future prospectively and critically [8]. Speculative design raises “What if?” questions about the future. It creates scenarios around these questions with tangible objects, so designers can fabricate an experience or a fictional story of that possible future. These can take the form of short sci-fi films, interactive prototypes, user manuals of future technologies, or fictional newspapers. In any case, speculative design does not aim to predict the future instead places new technological developments within imaginary but realistic everyday situations that allow people to debate the implications of different techno-scientific futures before becoming reality [9]. It can provoke with dystopian or ideal futures and inspire individual or community-based agency.

Participatory design encompasses different approaches and tools and has its roots “[...] in the movements toward democratization of work places in the Scandinavian countries.” [10]. One pioneer example for this formation is the UTOPIA project, which emphasised the cooperation between researchers and workers to improve work conditions. The Norwegian project transformed the concept of design through a participatory user involvement information and technology (ICT) development in the early 1980s [11]. The legacy of this movement is a user-centric approach and the democratization of who takes decisions. Radical participatory design [12] takes a further step enabling equal participation in the design process and co-leadership.

### 3. Participatory Design Thinking in the Context of CS

Design as research promotes creative sense-making and represents steadily evolving concepts in transdisciplinary practices. In particular, design thinking can encourage its applicants to show stronger commitment to challenges and can enable agency, curator- or careship. Participatory and community-driven design approaches can bring a more socially inclusive range of participants into the phases of problem definition, analysis, investigation, design and planning for implementation.

Figure 2 describes design thinking as a participatory approach to empower citizens and complements a representation of “Contributory and co-creative approaches in science: citizen social science, action research (AR), science shops, and civil society organisations (CSO)” [13].



Fig. 2 Design thinking in the context of citizen science and co-creation

#### 4. Conclusion and Outlook

Based on previous notes, the following considerations may be helpful to citizen science projects: Design thinking is a practical principle, which enables creativity processes and hands-on thinking. Furthermore, design thinking exercises help to engage voluntary participants already in the conceptual phase, during the problem definition, the needs analysis and the solution-seeking phase. This can be understood as a step towards a more in-depth participatory citizen science that complements approaches such as citizen social sciences empowering with creativity and idiosyncrasies as important resources for science. It can enable the collaboration and the team building of voluntary and professional experts: With design thinking, participants can find dynamic ways to translate between disciplines and praxis fields to overcome linear or silo thinking and to create unconventional ideas solving complex or wicked problems. Furthermore, design thinking can help citizen scientists to develop “21<sup>st</sup> century skills” [14]. The concept encompasses skills such as creativity, critical thinking and anticipation, which can be trained in citizen science projects.

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